Tracking Phosphorus loading Reductions in the Lake Memphremagog Watershed

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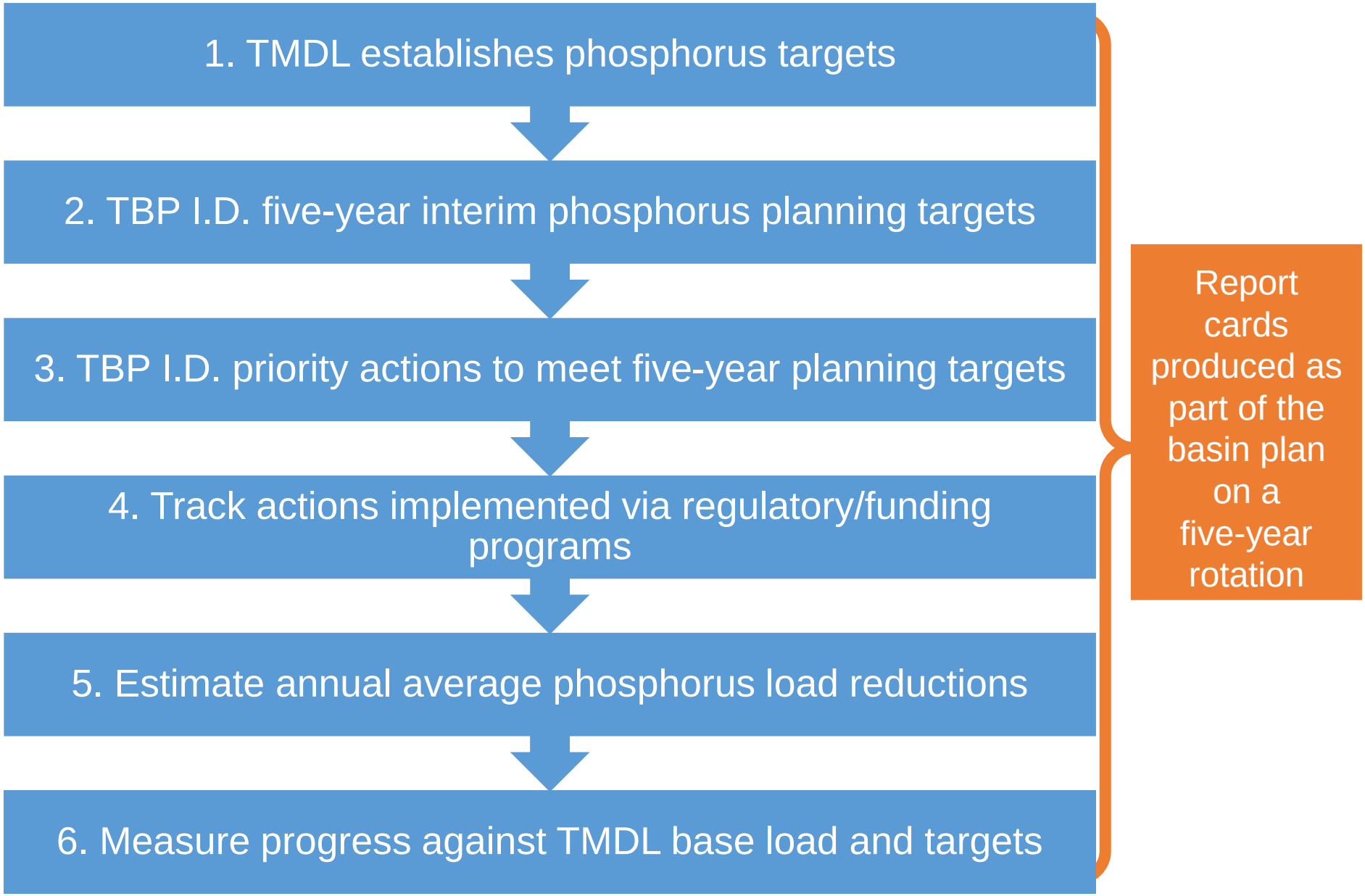
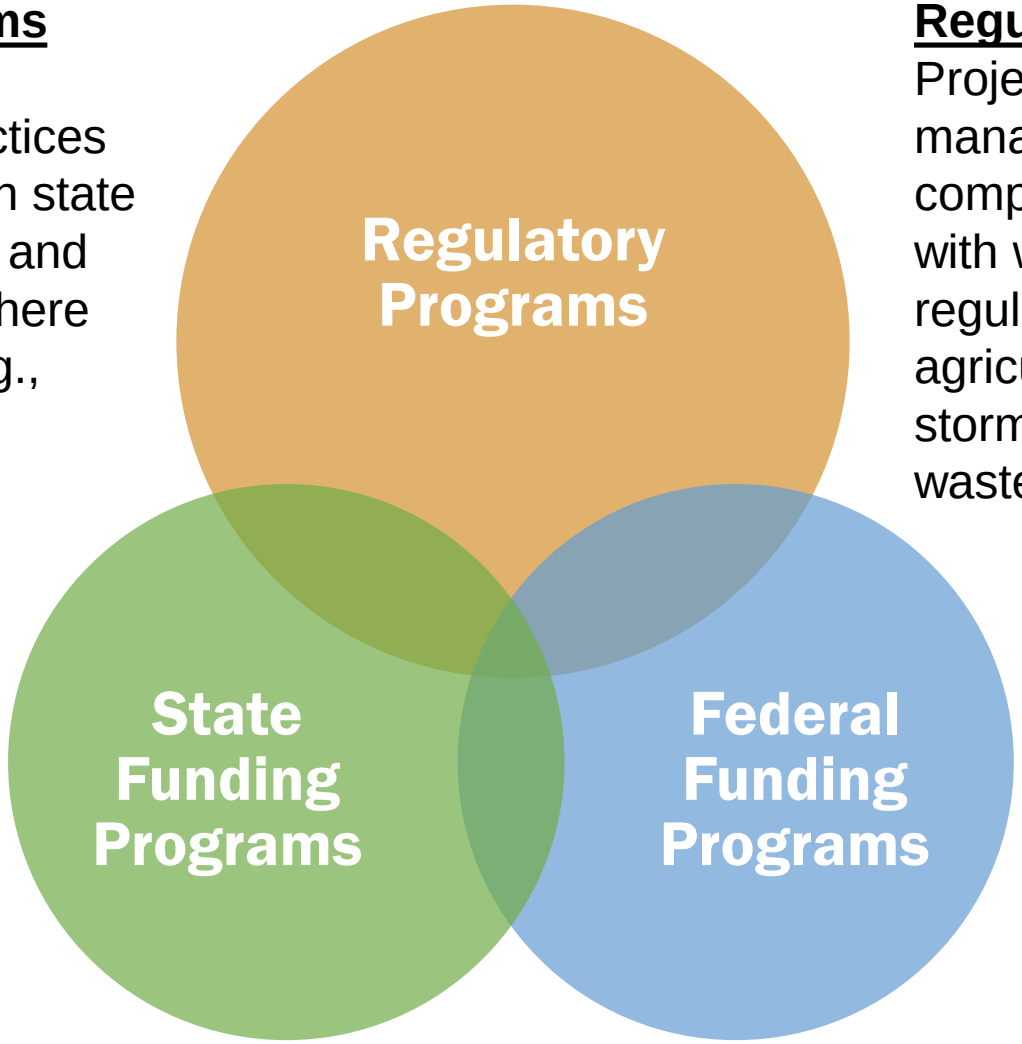
November 19, 2019

Lake Memphremagog TMDL Framework



Scope of Vermont's Clean Water Restoration Tracking (i.e., TMDL Progress)

Funding Programs
Projects/best management practices completed through state funding programs and other programs where data available (e.g., federal, local)



Regulatory Programs
Projects/best management practices completed to comply with water quality regulations for agriculture, roads stormwater, and wastewater

Clean Water Reporting Framework (CWRF) and BMP Accounting and Tracking Tool (BATT)

BMP System

System ID: 98

Current | Prior Use | Linked Projects

Name Livestock Exclusion and Riparian Buffer Installation

Latitude **Longitude** **Drainage Area** 12 - Mississquoi River

Notes

Land Use

+ Add Land Use

		ID	Land Use	Acres	Soil	Slope	P Load
Edit	Delete	284	Pasture	6.5	C	L	4.70925

BMP's

+ Add BMP

		ID	Type
Edit	Delete	135	Fencing/Livestock Exclusion
Edit	Delete	136	Riparian Buffer

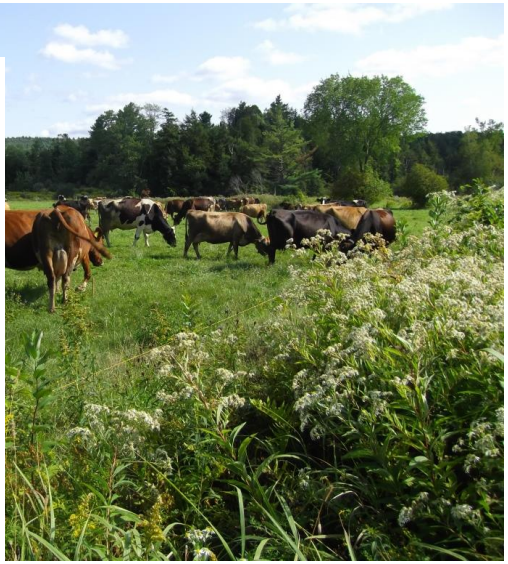
O&M

+ Add O&M

Loads and Reductions

Total Phosphorus Load	4.70925	kg/year
Computed Phosphorus Reduction	3.458944	kg/year
Override Phosphorus Reduction	☐	
Phosphorus Reduction	3.458944	kg/year

Update | Discard



Clean Water Reporting Framework (CWRF) and BMP Accounting and Tracking Tool (BATT)

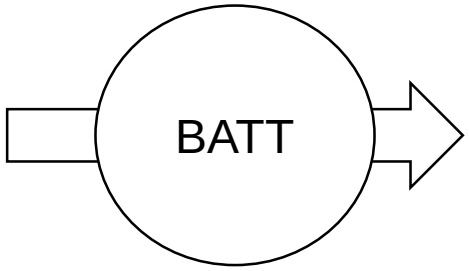
BATT Inputs

BMP location
(HUC 12, common field ID)

Area treated
(land use)

BMP type, characteristics

BMP lifespan



BATT Outputs

Estimates base load from land treated (based on land use export model)

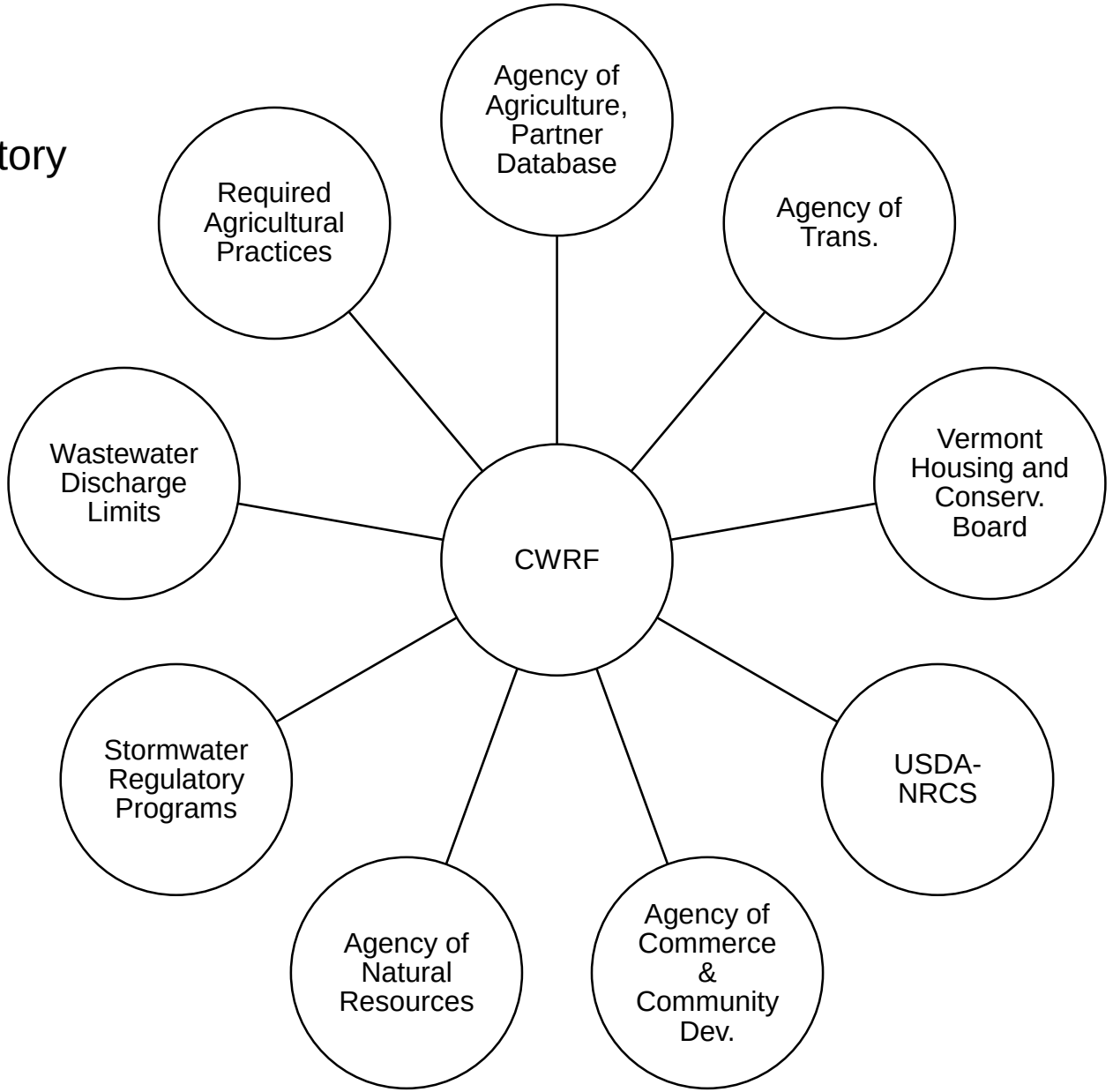
Applies BMP efficiency as % reduction to base load

Estimates annual average load removed by BMP

Factors combined effectiveness of BMP systems

Clean Water Reporting Framework (CWRF) & Data Streams

Projects/BMPs completed through funding and regulatory programs



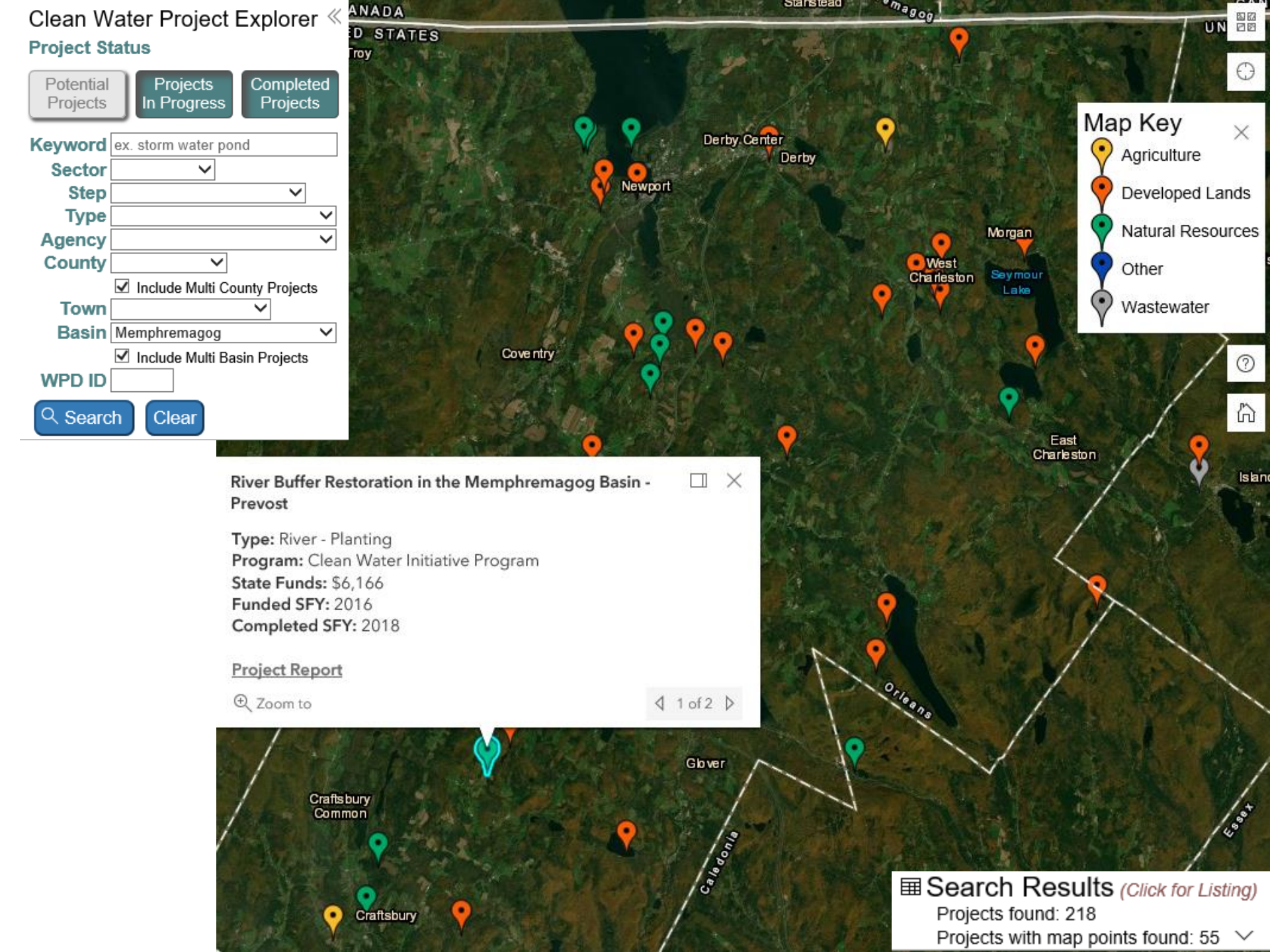

Clean Water Project Explorer
Project Status
Potential Projects
Projects In Progress
Completed Projects
Keyword
ex. storm water pond
Sector
Step
Type
Agency
County
Include Multi County Projects
Town
Basin
Memphremagog
Include Multi Basin Projects
WPD ID
Search
Clear
Map Key
Agriculture
Developed Lands
Natural Resources
Other
Wastewater
River Buffer Restoration in the Memphremagog Basin - Prevost
Type: River - Planting
Program: Clean Water Initiative Program
State Funds: $6,166
Funded SFY: 2016
Completed SFY: 2018
Project Report
Zoom to
1 of 2
Search Results (Click for Listing)
Projects found: 218
Projects with map points found: 55
Derby Center
Derby
Newport
Morgan
West Charleston
Seymour Lake
Coventry
East Charleston
Orleans
Glover
Craftsbury Common
Craftsbury
Caledonia
Essex

Table 1. Summary of Vermont's ability in SFY 2018 to account for nutrient pollution reductions by project type, basin, and nutrient of concern

Key
Currently have ability to account for nutrient pollution reduction
Do not currently have ability to account for nutrient pollution reduction

Project Type	Lake Champlain	Lake Memphremagog	Connecticut River
Agricultural cropland and pasture conservation practices	Phosphorus	Phosphorus	Nitrogen
Agricultural forested riparian buffers	Phosphorus	Phosphorus	Nitrogen
Barnyard and production area management practices	Phosphorus	Phosphorus	Nitrogen
River and floodplain restoration	Phosphorus	Phosphorus	Nitrogen
Riparian buffer restoration	Phosphorus	Phosphorus	Nitrogen
Lakeshore restoration	Phosphorus	Phosphorus	Nitrogen
Wetland restoration	Phosphorus	Phosphorus	Nitrogen
Forest erosion control	Phosphorus	Phosphorus	Nitrogen
Stormwater treatment practices	Phosphorus	Phosphorus	Nitrogen
Road erosion control practices	Phosphorus	Phosphorus	Nitrogen
Wastewater treatment upgrades	Phosphorus	Phosphorus	Nitrogen

Measure	2016	2017	2018	2019	Total
Acres conserved				269	269
Acres of agricultural land treated	822	2476	4840	5044	
Acres of agricultural land treated by filter strip buffer			20		20
Acres of agricultural land treated/improved through use of equipment per year				460	460
Acres of Production Area Inspected				10	10
Acres of riparian corridor conserved				12	12

←Measures for Agricultural Lands in the St. Francis River Watershed

Natural Lands

Measure	2016	2017	2018	2019	Total
Acres conserved as forestland		29			29
Acres of lakeshore restored	0				0
Acres of riparian corridor buffer planted/restored	4	6	15	1	27
Linear feet of riparian corridor buffer planted/restored		3800			3,800
Number of final (100%) designs completed	1		6		7
Number of preliminary (30%) designs completed	2				2
Number of projects identified	11		6		17
Number of stream crossings improved			1		1

Measures for Developed Lands

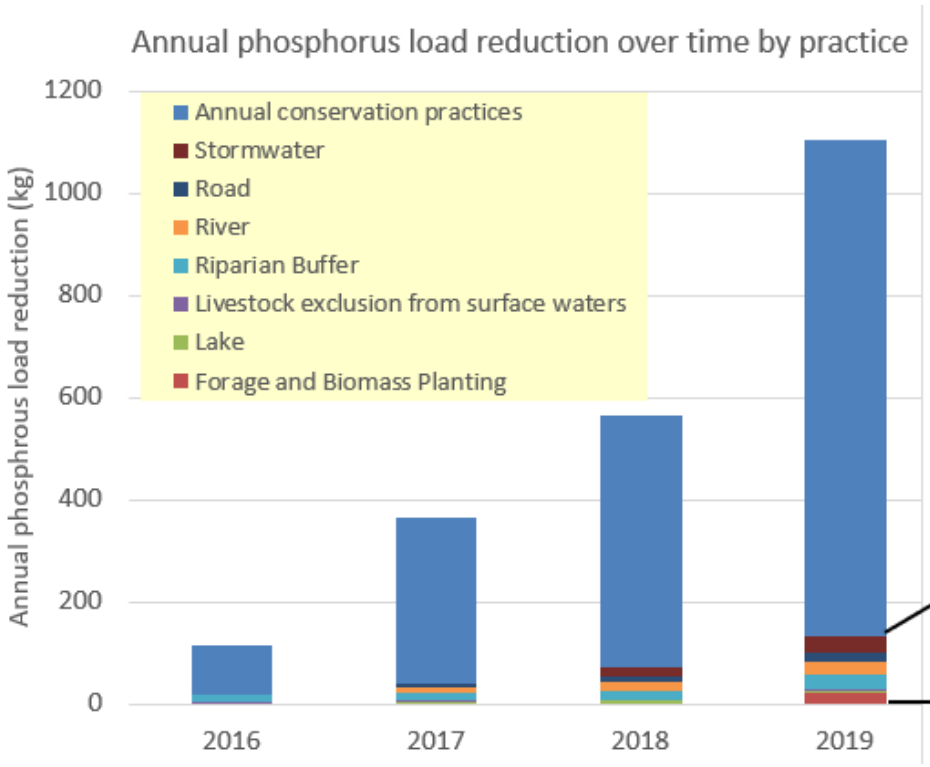
Measure	2016	2017	2018	2019	Total
Acres of existing impervious surface treated			13		13
Acres of new impervious surface treated			14	1	16
Acres of riparian corridor buffer planted/restored				3	3
Number of drainage structures installed/repaired				9	9
Number of final (100%) designs completed	3				3
Number of preliminary (30%) designs completed	1	4			5
Number of projects identified	4	20			24

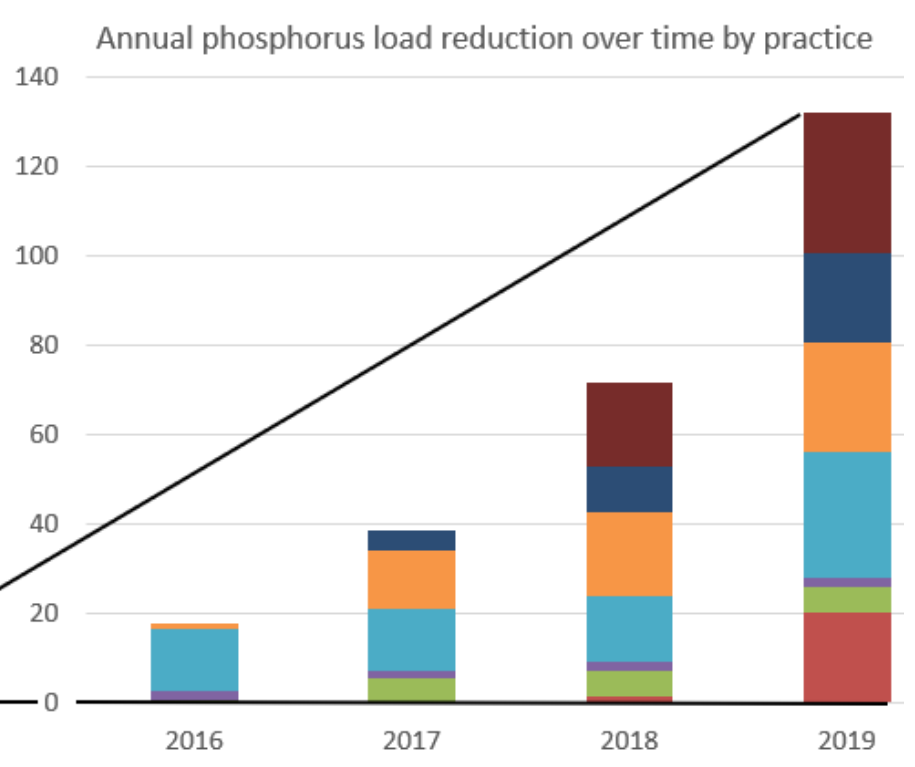
Measures for Transportation

Measure	2017	2018	2019	Total
Acres stabilized through use of hydroseeder/mulcher equipment per year		1	8	9
Linear feet of lakeshore restored		85		85
Linear feet of road drainage improved	15398	22021	53057	90475
Linear feet of road drainage improved through use of equipment per year			105600	105600
Number of drainage structures installed/repaired		10		10
Number of hydrologically connected road segments identified for improvements			302	302
Number of hydrologically connected road segments inventoried			600	600
Number of hydrologically connected road segments meeting MRGP standards			299	299
Number of municipal road drainage and stream culverts replaced	11	12	17	40
Road miles swept through use of equipment per year			40	40
Square feet of gully restored		1058		1058

Preliminary load reduction estimates for the Lake Memphremagog Watershed

- These preliminary load reduction estimates are likely to change as part of the annual performance report due January 15th
- An estimated phosphorus load reduction of 1104 kg or 7% of the TMDL reduction target of 15,220 kg per year
- Annual conservation practices (cover cropping, No-till practices) make up most of the estimated load reductions.
- Road, stormwater and buffer planting projects last for several years based on operation and maintenance agreements and so these will grow over time as more and more practices are added
- Several project types don't have phosphorus load reduction estimates yet

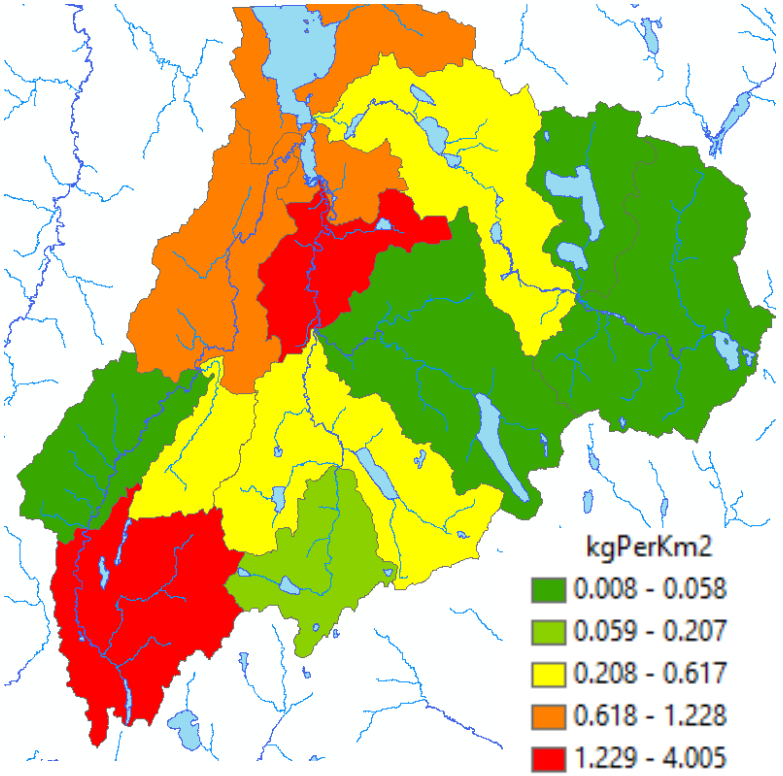




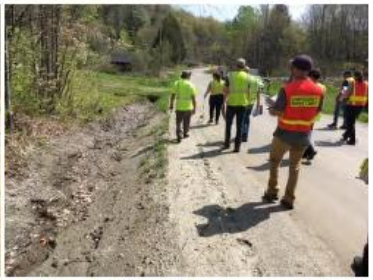
Estimated phosphorus load reduction by year by subwatershed

	Estimated Load Reduction (kg)			
Memphremagog subwatershed	**2016**	**2017**	**2018**	**2019**
Barton River-headwaters to Roaring Brook	3.3	5.1	1.9	13.4
Barton River-Roaring Branch to Willoughby River	19.7	22.2	13.7	84.3
Barton River-Willoughby River to mouth	8.3	13.6	77.9	158.8
Barton River-Willoughby River	2.8	5.7	2.4	5.7
Black River-headwaters to Seaver Branch	66.0	200.1	316.5	503.2
Black River-Lords Creek to mouth		2.5	10.7	130.9
Black River-Seaver Branch to Lords Creek		0.8	1.9	3.6
Black River-Lords Creek	11.7	11.7	12.7	23.8
Clyde River-Echo Lake stream to mouth	3.6	47.5	58.5	64.1
Clyde River-headwaters to Echo Lake stream			0.6	1.3
Clyde River-Seymour and Echo Lakes		2.3	3.4	3.8
Direct drainage-Lake Memphremagog	0.2	52.5	64.8	111.3
Total	**115.5**	**363.8**	**564.9**	**1,104.3**

Estimated phosphorus load reduction for 2019 in Kg per Km^2

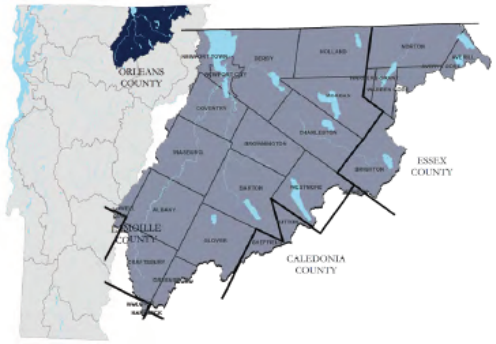


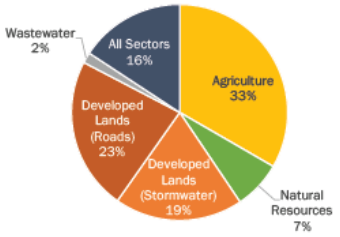
VERMONT CLEAN WATER INITIATIVE 2018 INVESTMENT REPORT



Lake Memphremagog Watershed Summary





State funding awarded in the Lake Memphremagog watershed, SFY 2016-2018, by sector
Total: $2,661,522

STATE FUNDS AWARDED IN SFY 2016-2018

RESULTS OF PROJECTS COMPLETED, SFY 2016-2018

Results of projects completed, SFY 2016-2018, by sector, in the Lake Memphremagog watershed.

AGRICULTURE PROJECT RESULTS	
Kilograms of total phosphorus reduced annually	–
Acres of agricultural land treated by conservation practices	2,405
Acres of land treated by forested buffers	–
Acres of pasture with livestock excluded from surface waters	–
Number of barnyard and production area practices installed	13
Acres of water quality protections within newly conserved agricultural lands	–
Estimated acres of agricultural land treated through innovative equipment	–

NATURAL RESOURCES PROJECT RESULTS	
Kilograms of total phosphorus reduced annually	24.2
Acres of forested riparian buffer restored through buffer planting	21
Acres of river corridor conserved through easements	–
Acres of floodplain restored	–
Stream miles reconnected for stream equilibrium/aquatic organism passage	–
Acres of wetland restored	–
Acres of forest conserved with special water quality protection	29
Number of stream crossings improved	1

DEVELOPED LANDS STORMWATER PROJECT RESULTS	
Kilograms of total phosphorus reduced annually	–
Acres of impervious surface treated	–

DEVELOPED LANDS ROAD PROJECT RESULTS	
Kilograms of total phosphorus reduced annually	6.6
Miles of municipal road drainage and erosion control improvements	6
Number of municipal road drainage and stream culverts replaced	22
Cubic yards of municipal Class 4 road gully erosion remediated	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–

WASTEWATER PROJECT RESULTS	
Kilograms of total phosphorus reduced annually	–
Number of combined sewer overflow abatements completed	–
Number of sewer extensions completed	–
Number of wastewater collection systems refurbished	–
Number of wastewater treatment facility refurbished	–
Number of wastewater treatment facility upgrades completed	–

VERMONT CLEAN WATER INITIATIVE

VERMONT

AGENCY OF ADMINISTRATION
AGENCY OF AGRICULTURE, FOOD & MARKETS
AGENCY OF COMMERCE & COMMUNITY DEVELOPMENT
AGENCY OF NATURAL RESOURCES
AGENCY OF TRANSPORTATION

https://dec.vermont.gov/water-investment/cwi/reports

Act 76 Technical Elements: Target-Setting and Accountability